Ultrasonographic Diagnosis of Sharp Foreign Body Syndrome in Buffaloes

A thesis presented by

Oday Shihab Al-Abbadi

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Introduction
Foreign body syndrome (FBS) causes severe economic losses, because buffaloes constitute a main source of meat and milk production.

The incidence of this disease in buffaloes is high in all developing countries especially in Iraq (20%), Egypt (25%) and India (23%).
The diagnosis of SFBS were based on history and clinical findings. Metal detectors which identify reticular metals but do not distinguish between perforating and non-perforating foreign bodies. Recently, ultrasonography provides a good diagnostic tool for diagnosis of such syndrome in cattle and buffaloes (Abdelaal and Floeck, 2015).
The aim of this study was
1. To describe the normal ultrasonographic techniques used for examination of the reticulum, rumen, omasum, abomasum, liver, spleen, lungs and heart and the relation between reticulum and this organs in healthy buffaloes.

2. Determined the ultrasonographic findings in various affected organs in the buffaloes ingested sharp foreign bodys.

3. Evaluate the reticular motility including frequency /5 minutes, duration, relaxation periods and amplitude of reticular contractions in healthy and diseased buffaloes with foreign body syndrome.
4. Evaluated the thickness of the reticular wall and the distance between the reticulum and abdominal wall in healthy and diseases buffaloes.

5. Determined The correlation between these measured values in healthy and diseased buffaloes for assessment early diagnosis and prognosis of sharp foreign body syndrome.
This study was carried out in both Veterinary clinics at Faculty of Veterinary Medicine, Cairo and Zagazig Universities.
1. Buffaloes during this study were classified into two groups

1.1. Control group

Twenty (20) clinically normal buffaloes of different ages and body weight were used as a control group to evaluate the normal clinical and ultrasonographic parameters.
1.2. Diseased group

A total of 346 buffaloes with history of indigestion were examined between the periods of September 2012 to a September, 2015.

Out of 346, 85 buffaloes of different ages and body weight were diagnosed as hardware disease by:

Clinical examinations, ultrasonography, paracentesis and rumenotomy.
2. Clinical examinations were included: Detection of Heart rate/min, respiratory rate/min, Temperature, condition of mucous membrane and ruminal movements.

3. Ferroscopy (metal detector) was used to diagnosed the metallic foreign body.
4. Ultrasonographic examination

A portable ultrasound scanner (Sono Site, USA) equipped with 3.5 and 5 MHz convex sector transducer.
In addition, fixed ultrasound device (Toshiba just vision 200, Japan).
Examination of the reticulum:

Ultrasonographic examination of the reticulum was done by using a 3.5-5 MHz convex transducer was applied in the area from 6th to 8th intercostal space.

The reticulum was firstly examined from the left side and then the right.

The ultrasonographic examination was done according to (Braun, 2003).
Braun and Götz (1994)
Reticular shape (contour), Thickness of the reticular wall and Reticular motility were determined ultrasonography in both control and diseases buffaloes during this investigation.

In each 5-minute recording, the number of reticular contractions and the interval between each biphasic contraction were determined.
The duration of 1st and 2nd reticular contractions and relaxation period between two reticular contractions were determined.

The distance between the reticulum and the abdominal wall and the amplitude of the 1st and 2nd contractions were determined with an electronic ruler.
Ultrasonographic examination of the heart

Heart were examined from the third and fourth intercostal spaces on both sides of the thorax using 3.5 MHz convex probe.
(Budras, K.D. and Habel, R. E. (2011))
Ultrasonographic examination of the lung

The ultrasound examination was performed on the area between the fifth and twelfth intercostal spaces.
Confirmatory techniques

1. Percutaneous aspiration under ultrasonographic guidance.

2. Laparo rumenotomy
Statistical analysis

Data were analyzed by IBM SPSS (version 20) using one way ANOVA.
Results
Normal ultrasonographic findings

The relation of reticulum with adjacent abdominal organs:
The examined areas from right side in a buffalo
The examined areas from left side in a buffalo
Ultrasonogram of a normal buffalo’s spleen and reticulum when the transducer placed at left 6th to 8th ICS. using 3.5 MHz convex transducer.
Ultrasonogram of a normal buffalo’s reticulum (Re), imaged by 3.5 MHz convex transducer from right 7th ICS showing: liver (L) and omasum (Om). TW: Thoracic wall, Dr: Dorsal, Vt: Ventral.
Ultrasonogram of a normal buffalo’s heart imaged at 3rd and 4th ICS using a 3.5 MHz convex transducer.
Ultrasonogram of a normal buffalo’s reticulum (Re), imaged from left 5th ICS at the level of left elbow showing lung (Lu), rumen (Ru) and spleen (S)
Hardware diseased group

Out of 346 buffaloes with signs of indigestion, (85 buffaloes, 24.6%) were affected by SFBS.

The recorded complications of sharp foreign body syndrome in the examined buffaloes were collected and classified according to the clinical and ultrasonographic findings into two main groups.
<table>
<thead>
<tr>
<th>Complications</th>
<th>No.</th>
<th>%</th>
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<tbody>
<tr>
<td><strong>Abdominal involvement</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1- Local peritonitis (LP)</td>
<td>34</td>
<td>40</td>
</tr>
<tr>
<td>2- Abdominal abscesses (AA)</td>
<td>18</td>
<td>21.2</td>
</tr>
<tr>
<td>3- Diffuse peritonitis (DP)</td>
<td>8</td>
<td>9.4</td>
</tr>
<tr>
<td><strong>Thoracic involvement</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1- Traumatic pericarditis (TP)</td>
<td>15</td>
<td>17.65</td>
</tr>
<tr>
<td>2- Thoracic abscess (TA)</td>
<td>4</td>
<td>4.7</td>
</tr>
<tr>
<td>3- Diaphragmatic hernia (DH)</td>
<td>4</td>
<td>4.7</td>
</tr>
<tr>
<td>4- Pleuropneumonia (PP)</td>
<td>2</td>
<td>2.35</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>85</td>
<td>100%</td>
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</table>
The effects of SFBS on vital parameters
Heart rate/minute in buffaloes suffering from foreign body syndrome Compared to healthy buffaloes. Data are presented as Mean ± SEM. Columns with different alphabets are significantly different at P<0.05.
Respiratory rate/minute in buffaloes suffering from foreign body syndrome compared to healthy buffaloes. Data are presented as Mean ± SEM. Columns with different alphabets are significantly different at P<0.05.
Ruminal movement /2 minutes in buffaloes suffering from foreign body syndrome compared to healthy buffaloes. Data are presented as Mean ± SEM. Columns with different alphabets are significantly different at P<0.05.
Temperature / °C in buffaloes suffering from foreign body syndrome compared to healthy buffaloes. Data are presented as Mean ± SEM. Columns with different alphabets are significantly different at P<0.05.
Ultrasonographic findings of the diseased group
1. Reticular features

1.1. Contour of reticular wall
Ultrasonogram of the reticulum in a hardware diseased buffalo showing uneven surface, corrugated contour
Relation of the reticulum with adjacent organs

Abdominal involvement
Ultrasonogram of a buffalo with local peritonitis showing corrugated reticulum and echogenic fibrin strands interspersed with anechoic fluid between reticulum and abomasum.
Ultrasonogram of buffaloes with abdominal abscess showing a circumscribed mass with hypoechoic center and echogenic wall locating between Reticum and Abomasum.
Ultrasonogram of a buffalo with hardware disease showing diffuse echogenic strands interspersed with anechoic fluid involving the whole abdomen (diffuse peritonitis)
Thoracic involvement
Ultrasonogram of a 7-year-old buffalo with TA at the 3rd ICS showing a large sized abscess (20 cm) with hypoechoic content and echogenic capsule.
Ultrasonogram at the left 4th. ICS of an 8-y-old buffalo with suppurative pericarditis showing hypoechoic pus.
Ultrasonogram of Traumatic pleuropneumonia in a 10-y-old buffalo imaged from 5th right ICS showing hypoechoic exudates in the pleural cavity, absence of reverberation artifacts, presence of comet tail artifacts and hepatized lung
Ultrasonogram of diaphragmatic hernia imaged at 4th ICS showing: half-moon shaped reticulum locating beneath the heart from left side.
Effects of SFBS on the reticular features and motility
Frequency of reticular contractions (per 5 minutes) in buffaloes suffering from sharp foreign body syndrome compared to healthy animals. Data are presented as Mean ± SEM. Columns with different alphabets are significantly different at P<0.05.
Thickness of reticular wall (centimeter) in buffaloes suffering from sharp foreign body syndrome compared to healthy buffaloes. Data are presented as Mean ± SEM. Columns with different alphabets are significantly different at P<0.05.
Distance between reticulum and abdominal wall (centimeter) in buffaloes suffering from sharp foreign body syndrome compared to healthy animals. Data are shown as Mean ± SEM. Columns with different alphabets are significantly different at P<0.05
Duration of 1st reticular contraction (second) in normal and hardware diseased buffaloes. Data are shown/presented as Mean ± SEM. Columns with different alphabets are significantly different at P<0.05.
Duration of 2nd reticular contraction (second) in normal and hardware diseased buffaloes. Data are presented as Mean ± SEM. Columns with different alphabets are significantly different at P<0.05.
Relaxation period of reticulum (second) in healthy and hardware diseased buffalo. Data are shown as Mean ± SEM. Columns with different alphabets are significantly different at P<0.05.
Amplitud of 1st reticular contraction (centimeter) in normal and hardware diseased buffaloes. Data are presented as Mean ± SEM. Columns with different alphabets are significantly different at P<0.05.
Amplitude of 2nd reticular contraction (centimeter) in normal and hardware diseased buffaloes. Data are shown as Mean ± SEM. Columns with different alphabets are significantly different at P<0.05.
Surgical treatment
Rumenotomy

It was applied on 28 cases out of 85 animals with TRP
Rumen contents appeared hard with undigested ingesta in 22 buffaloes (Fig., a). Frothy and slimy rumen contents were detected in 6 Buffaloes with diaphragmatic hernia (Fig., b).
2. Paracentesis

Abdominocentesis was applied on 9 cases while thoracocentesis was applied on 2 cases.
(a) Abdominocentesis (b) and thoracocentesis in buffaloes with abdominal and thoracic abscesses showing creamy watery pus
1. Clinical signs of foreign body syndrome in buffaloes are non-specific in diagnosis of such conditions.

2. Ultrasonography is an ideal diagnostic tool for the investigation of sharp foreign body syndrome in buffaloes.
3. Ultrasonography successfully differentiate between abdominal and thoracic lesions which clinically difficult to differentiate.

4- Abdominal ultrasound is an essential tool for diagnosis of local and diffuse peritonitis and abscesses as sequalae for TRP in buffaloes.

5- Thoracic ultrasonography in buffaloes with foreign body syndrome proved good diagnostic technique for differentiates between traumatic pericarditis, pleuropneumonia, diaphragmatic hernias and thoracic abscess.
6. Ultrasonography of the reticulum and neighboring organs in buffaloes is a valuable tool for better understanding the features of reticulum and relation to neighboring organs in healthy and diseased buffaloes.

7. Ultrasonographic examination of the reticulum is not only useful for detection of TRP but also can detect the foreign body itself. Therefore, allowed concrete decision concerning treatment and prognosis.

8. Ultrasonography provides more information about the site of abdominal and thoracic abscesses and the suitable site for aspiration.